ABSTRACT OF THE DISCLOSURE

A synthetic route for producing nanostructure metal-oxide-based materials using sol-gel processing. This procedure employs the use of stable and inexpensive hydrated-metal inorganic salts and environmentally friendly solvents such as water and ethanol. The synthesis involves the dissolution of the metal salt in a solvent followed by the addition of a proton scavenger, which induces gel formation in a timely manner. Both critical point (supercritical extraction) and atmospheric (low temperature evaporation) drying may be employed to produce monolithic aerogels and xerogels, respectively. Using this method synthesis of metal-oxide nanostructured materials have been carried out using inorganic salts, such as of Fe^{3+}, Cr^{3+}, Al^{3+}, Ga^{3+}, In^{3+}, Hf^{4+}, Sn^{4+}, Zr^{4+}, Nb^{5+}, W^{6+}, Pr^{3+}, Er^{3+}, Nd^{3+}, Ce^{3+}, U^{3+} and Y^{3+}. The process is general and nanostructured metal-oxides from the following elements of the periodic table can be made: Groups 2 through 13, part of Group 14 (germanium, tin, lead), part of Group 15 (antimony, bismuth), part of Group 16 (polonium), and the lanthanides and actinides. The sol-gel processing allows for the addition of insoluble materials (e.g., metals or polymers) to the viscous sol, just before gelation, to produce a uniformly distributed nanocomposites upon gelation. As an example, energetic

nanocomposites of Fe_xO_y gel with distributed Al metal are readily made. The compositions are stable, safe, and can be readily ignited to thermitic reaction.